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Progress Report No. 4

Report Period: 19 April 1966 to 27 May 1966

Project Title: Gems Development (continuation)

PROJECT IDENTIFICATION

Contractor's Project No. . . . . SPO 27203

Customer's Project No. 99740-6

Contract No. . . . . [redacted] STAT

FISCAL DATA

Type of Contract	CPFF
Total Contract Price	[redacted] STAT
Scheduled Completion Date	30 June 1966
Percent of Total Funds Expended	26.4% as of 29 Apr. 1966
Percent of Work Completed	26.4% as of 29 Apr. 1966

Status of Overall Project

During the fourth month of this program, all elements of the expanded Gems facility were completed. The second dark room has been equipped and the second Gems making unit was finished. The facility is now adequate to service every photographic requirement of this Gems program.

STAT [redacted] Also during this period, a conference was held with the [redacted] STAT subcontractor (5 and 6 May at P-E) and subsequently with personnel at the customer's facility. Details on this and other subtasks are given below.

Gems Study

a) Psychophysical Testing

Conferences to date with customer and subcontractor personnel have resulted in a decision to make a negative Gems matrix having the dimensions of MTF and exposure. The specific system for which these Gems will be prepared has been agreed on and the source of the prerequisite photographic imagery has been identified. A tentative visit to the customer's facility has been scheduled for the week of 30 May 66, at which time the prerequisite imagery
STAT would be selected and delivered to [redacted]

It is apparent at this time that Gems will not be ready for psychophysical testing before mid July at the earliest. Considering the delays that have already occurred in the initiation of this task there is a strong likelihood that some slippage beyond the scheduled completion date of 10 Sept. 66 will occur. This potential slippage does not as yet endanger the timely completion of the total Gems program.

b) Refinement of Existing Techniques

An important area of evaluation is the accuracy with which the MTF of the photographic image can be controlled. This portion of the study requires an experimental investigation wherein Gems are made and the MTF of the photographic image is determined by edge gradient techniques. Before proceeding with this experimental work some further evaluation of the edge gradient technique had to be made. To this end an experiment was performed such that a known degree of linear image motion was introduced during the exposure of a knife edge target. The MTF's of the photographic images thus produced (with and without image motion) were determined by edge gradient analysis. By dividing the MTF with image motion by the MTF without image motion a result was obtained that could be compared to the MTF of linear image motion that had been introduced experimentally. This result is given in the attached figure. The agreement between experimental determination and analytical prediction is excellent. Additional experiments will be performed including higher spatial frequencies (up to 200 cycles per millimeter).

Note: A complete evaluation of the edge gradient technique is not within the scope of this program. Only that work will be performed which is essential to the application of edge gradient analysis to the monitoring of Gem characteristics.

Alternate Technique

The theoretical analysis of the alternate methods of preparing Gems has been initiated. At this point, it still appears that a lens copy system utilizing aperture stops in the entrance pupil is to be preferred over other techniques such as spatial filtering, etc.

Gems Viewer

It is anticipated that a Gems viewer of universal utility will necessitate the accommodation of roll film in widths up to 9½ inches. This aspect of the design study is being examined in some detail while the less well defined areas such as Gems handling equipment are studied. Here consideration is being given to aperture cards, slide cartridges, projection systems, direct viewing, range of magnification, continuously variable magnification, etc.

Work for Next Period

There will be a continuation of all activities covered in this report during the next period. A specific milestone will be the acquisition of the photographic imagery required in the preparation of Gems for the Psychopysical study.

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